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Short communication

Intraspecific nest parasitism and nest guarding in the Pied Flycatcher *Ficedula hypoleuca*

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Intraspecific nest parasitism (INP) is common among precocial birds, but there are fewer reports of INP among altricial birds (Yom-Tov 1980, Rohwer & Freeman 1989). There are several possible explanations for this dichotomy, one of which is that much more work has been done on this aspect in waterfowl than in other birds (Rohwer & Freeman 1989). Another explanation is that the cost of rearing an unrelated chick is greater for altricial birds, which invest more in rearing chicks than in production of eggs (Yom-Tov 1980, Rohwer & Freeman 1989). In most temperate bird species, laying females tend to reduce nest detection by predators by avoiding the vicinity of their nests during the day except for the short time required to lay an egg (Pettingel 1967). However, by staying in or around their nest, females may decrease the rate of INP in their nests, and one would predict that nest guarding will occur mainly among altricial species (Rohwer & Freeman 1989, Petrie & Møller 1991). Females defend their nests in various ways: female White-fronted Bee-eaters *Merops bullckoides* spend most of their daytime at their nests after laying their first egg (Emlen & Wrege 1986), female Eastern Bluebird *Sialia sialis* forage close to their nestboxes during the egg-laying period, when their nests are most vulnerable to INP (Gowaty *et al.* 1989) and are most aggressive towards other females during early stages of the nesting cycle (Gowaty & Wagner 1988), and nest guarding can reduce the rate of INP in Barn Swallows *Hirundo rustica* (Møller 1987, 1989).

The Pied Flycatcher *Ficedula hypoleuca* is one of the best studied European passerines but, in their book on its biology, Lundberg & Alatalo (1992) found no evidence for INP among the population they studied in Finland, and concluded that egg dumping in this species must be very rare. However, G. Högstedt (pers. comm.) and Haland (1986) found that INP occurs in 5% of nests in a Norwegian population, and Gelter and Tegelström (1992) found one case of INP among 22 nests (4.5%) in a Swedish population. The latter authors suggested that their finding is an accidental mislaying. We report here the occurrence of INP in the Pied Flycatcher in Wales.

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MATERIAL AND METHODS

This study was conducted in Abergywngregyn Nature Reserve, North Wales (53°15'N, 04°07'W), where Pied Flycatchers breed in wooden nestboxes. As in all other passerines, female flycatchers normally lay one egg each morning until the completion of the clutch, and start incubation on the day the last egg is laid. Thus, the appearance of more than one egg per day in a nest is an indication of INP (Yom-Tov 1980). The study area is a mature oak forest on a hill slope, where 50 nestboxes were placed in an area of about 50 ha. We followed the population from nest building onwards during the breeding season in 1998. Each nest was checked between late morning and early afternoon every second day and the number of eggs laid noted, as well as the presence of a female in the nest, if she was found sitting on the eggs or flew off as we approached the nest (frequently females were aware of our approach even before we reached the nest).

RESULTS AND DISCUSSION

Between 1–24 May 1998, female flycatchers laid eggs in 28 boxes. Mean clutch size was 7.25 eggs (sd = 0.84, range 5–9). In most nests one egg appeared per day, but in two nests (numbers 7 and 22) two eggs appeared on one day. These extra eggs appeared after the laying of the first and fifth eggs, respectively, and final clutch size in both nests was eight eggs. It is possible that one of the extra eggs in box 7 was laid by a neighboring female, as in a nearby nestbox (number 23, less than 50 m away from box 7) the sequence of laying was interrupted for one day after the laying of the first egg, on the day that an extra egg appeared in nestbox 7. One of the extra eggs was very distinctive from the other eggs in the box, being paler and having a different shape. Hence, INP occurred in 7.1% of the nests. In another study area, on the other side of the valley, no case of INP was noted among the 23 occupied nestboxes there. When the rate of INP is calculated for both areas, it is 3.9%.

We calculated the probability of detection (P_c) for dumped eggs in our different brood sizes using the method of Gowaty and Bridges (1991). The probabilities for five to nine egg clutches were 0.667, 0.714, 0.750, 0.778 and 0.800, respectively. These multiplied through by the proportions of clutches of each size, five to nine eggs (2%, 22%, 44%, 30% and 2%, respectively) gives $f(N)P_c$ values of 0.013, 0.157, 0.330, 0.233 and 0.016,

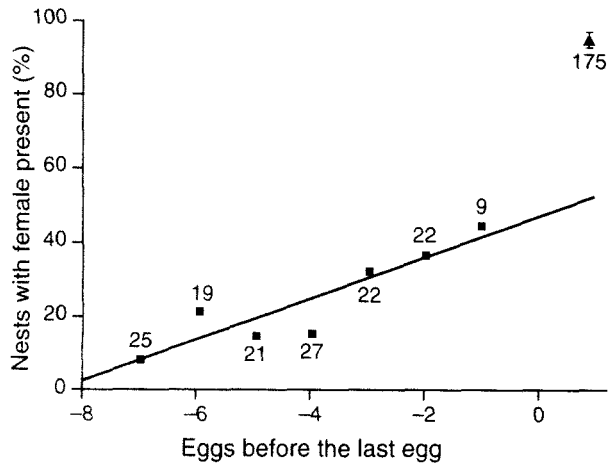

Figure 1. The relationship between the number of eggs (x) in a nestbox and percent of nest checks in which a female was found present in the nest (y). df = 6, $y = 1.93 + 5.62 \times x$, $r^2 = 0.824$. Nests with complete clutches are not included in the regression (i.e. data with squares are for all but the last laid eggs). Mean (± se) female presence in the nest during the first seven days after clutch completion, which represents incubation, is shown (▲) for all nests. Sample sizes are given near each point.

respectively, and therefore an average probability of detecting INP in the flycatcher at Aber in 1998 of 0.749. Hence, the estimated rate of INP in our study area is 3.9/0.75 = 5.2%. This value is very similar to those reported in other studies of this species (Haland 1986, Gelter & Tegelström 1992).

Females were present in nestboxes even before the completion of their clutch, and the rate of female presence was positively related to the number of eggs in the nest box ($P = 0.0054$, $r^2 = 0.824$; Fig. 1). Females were present at their nests during 44.4% of nest checks on the day before the last egg was laid, while during the first 7 days after incubation started they were present, or the eggs found warm, in 94.6% of nest checks (sd = 5.85; Total 175 nest checks; Fig. 1). The female presence in nests before the start of incubation did not affect the length of incubation, as all eggs in all clutches hatched within a day of each other.

Similar behaviour was observed in the Common Starling *Sturnus vulgaris*, where the presence of the female in its nest increased linearly from 11% to 78% after the laying of the first and penultimate (usually fourth) eggs, respectively (Meijer 1990). INP is very common in the Common Starling (see Rohwer & Freeman 1989 for review), and the increased presence of the female in the nest during the egg-laying period in both Pied Flycatcher and Common Starling might be considered nest guarding. In one case in the present study, we found a dead female in a nestbox, the eggs in this nest were not damaged, and the ringed female carried on laying in this box normally. Apparently, the dead female was killed by either the female or male inhabiting this box. Thus, INP occurs at a low rate in the Pied Flycatcher, and females guard and defend their nests against INP during the time they are most vulnerable to it.

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